

# CPQCC Hypothermia Webinar

December 1, 2021

12pm – 1pm



# CPQCC Hypothermia Webinar

## AGENDA


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TIME	TOPIC	SPEAKER
12pm – 12:02pm	Welcome and Intros	Henry Lee, MD
12:02- 12:17pm	CPQCC Early Screening and Identification of Candidates for Neonatal Therapeutic Hypothermia Toolkit	CPQCC Hypothermia Toolkit Author – Dongli Song, MD, PhD
12:17pm – 12:32pm	Current updates on HIE management	CPQCC Hypothermia Toolkit Author – Krisa Van Meurs, MD
12:32pm – 12:47pm	Demo of the CoolTool & NeoCool	<u>CoolTool</u> – Tom Shimotake, MD <u>NeoCool</u> – Mary Harbert, MD
12:47pm – 1:00pm	Q&A	Moderator(s) Henry Lee & Priya Jeegatheesan, MD

# Webinar Logistics

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- Attendees are automatically muted upon entry
- The “chat” function has been disabled. **Please utilize the Q&A box if you are having technical difficulties and to submit any questions you have for the presenters. We will answer as many questions as possible during the Q&A portion of the webinar.**
- The slides and webinar recording will be sent out after the webinar and will also be posted on the CPQCC website.



CPQCC Early Screening and  
Identification of Candidates for  
Neonatal Therapeutic  
Hypothermia Toolkit

Dongli Song,  
MD, PhD



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## Early Screening and Identification of Candidates for Neonatal Therapeutic Hypothermia Toolkit

Therapeutic hypothermia, when initiated within six hours of birth, has been shown to significantly improve survival and neurodevelopmental outcomes in neonates with moderate to severe hypoxic-ischemic encephalopathy (HIE). However, not every baby who might benefit from cooling therapy is identified or referred to a regional cooling center in a timely fashion. Early identification of the risk factors for perinatally-acquired asphyxia and recognition of the signs and symptoms of neonatal encephalopathy are challenging even for the most experienced neonatologists.

- To recognize that these are **screening criteria only**, meant to improve early identification of at-risk babies who might warrant closer assessment.
- They are intentionally designed with more inclusive criteria and are **NOT by themselves qualifying criteria for cooling therapy**.

**Author:**

Priya Jegatheesan  
Anna Morgan  
Thomas Shimotake  
Dongli Song  
Krisa Van Meurs

**Resource Category:**

QI Toolkit

**Date:**

February 2015

**Related Links:**

[HIE Calculator \(Cool Tool\)](#)

 [DOWNLOAD TOOLKIT »](#)

# Objective

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To provide a **strategic approach** and **reliable tools** to assist birth hospitals in the **timely identification** of newborns that are potential candidates for therapeutic hypothermia.

# Screening Criteria

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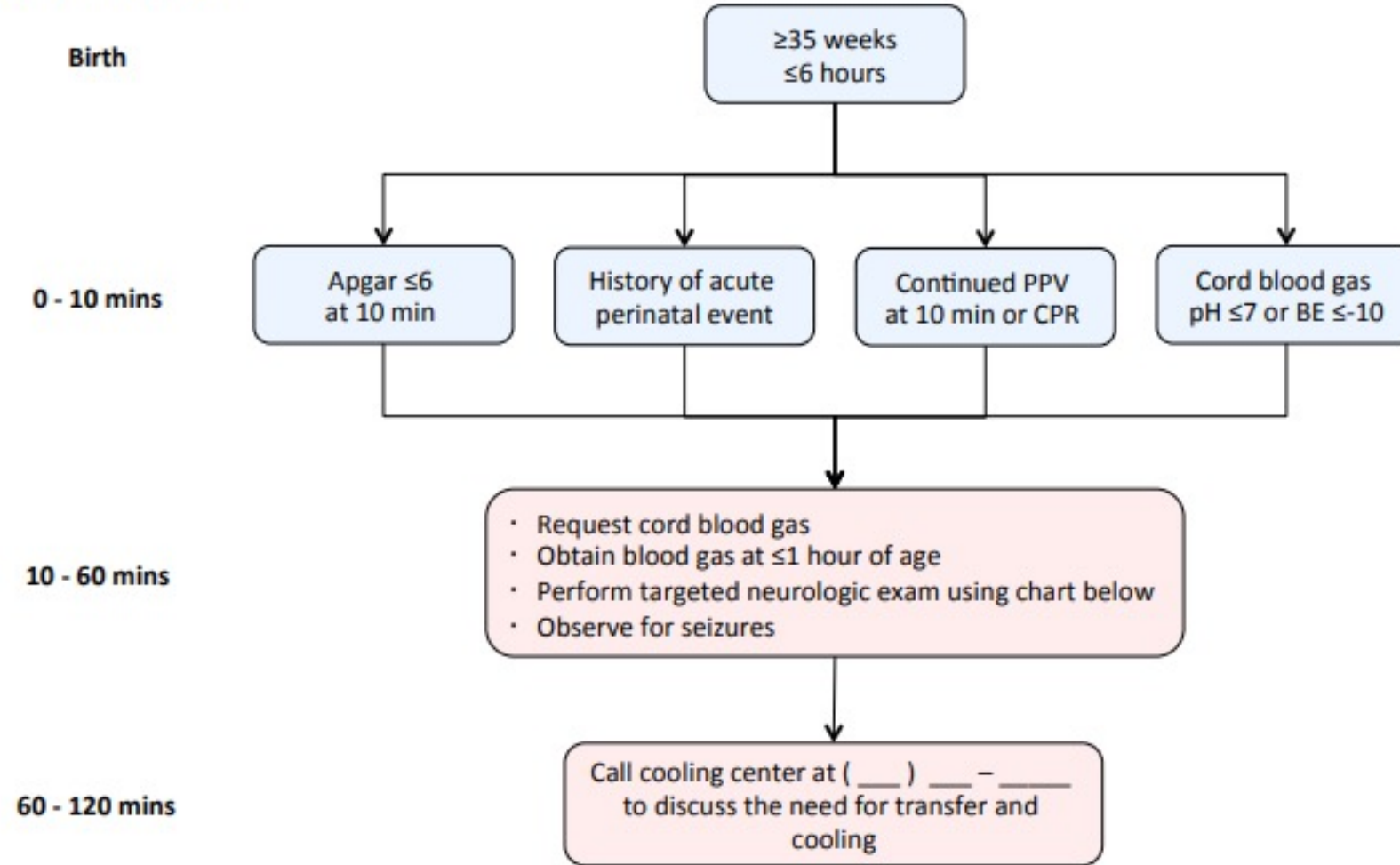
$\geq 35$  weeks gestational age and  $\leq 6$  hours old **AND** any one of the following must also be present:

- 1) History of acute perinatal event and risk factors:  
placental abruption, cord prolapse, uterine rupture and fetal bradycardia  
prolonged rupture of membranes, abnormal fetal heart rate tracings,  
thick meconium stained fluid, tight nuchal cord, and failed vacuum delivery.
- 1) Apgar  $\leq 6$  at 10 minutes
- 2) Continued need for PPV for 10 minutes or history of CPR
- 3) Venous or arterial cord gas or baby blood gas (within 1 hour of life)  
with  $\text{pH} \leq 7$  or  $\text{BE} \leq -10$

# Appendix A

## Screening Criteria for Evaluation of Risk for Neonatal Encephalopathy (NE)

### Goal timeline



# Neurological Exam

## Level of encephalopathy

	Mild	Moderate	Severe
<b>Level of consciousness</b>	Irritable / hyperalert	Lethargic / obtunded	Stupor / coma
<b>Spontaneous activity</b>	Normal / increased	Decreased	No activity
<b>Posture</b>	Normal	Distal flexion / Complete extension	Decerebrate
<b>Tone</b>	Normal / increased	Hypotonic	Flaccid
<b>Primitive reflexes</b>			
<b>Suck</b>	Normal	Weak	Absent
<b>Moro</b>	Normal	Incomplete	Absent
<b>Deep tendon reflexes</b>	Mildly brisk	Brisk	Suppressed
<b>Autonomic system</b>			
<b>Pupils</b>	Normal	Constricted	Deviated, dilated, non- reactive
<b>Heart rate</b>	Increased	Bradycardic	
<b>Seizures</b>	None	Common	Common

# Passive Cooling

1. Document Regional Cooling Center contacted and decision made to initiate passive cooling for those determined to be a candidate for cooling.
2. Turn radiant warmer off and leave infant uncovered, except diapers.
3. Monitor core/rectal temperature continuously (if equipped) or every 15 minutes using a lubricated digital thermometer carefully inserted 2 cm into rectum. If core temperature monitoring cannot be done safely or is not available, monitor axillary temperatures every 15 minutes. Record temperatures on flow sheet (see Appendix H).
4. Allow temperature to fall to target temperature ranges:
  1. Target rectal temperature is **33-34°C or 91.4-93.2°F** .
  2. Target axillary temperature is **32-33°C or 89.6-91.4F**.



# Passive Cooling –cont.

5. Avoid overcooling. When the rectal temp reaches **33 °C (91.4 °F)** or axillary temp **32 °C (89.6 °F)**, turn warmer back on to lowest setting or covering patient with clear plastic (avoid face).
6. If rectal temp continues to fall quickly or remains **< 33 °C (91.4 °F)** or axillary temp **< 32 °C (89.6 °F)**, increase warmer setting. Recheck temperature until recovered.
7. Avoid overheating. Minimize big changes in heater settings that may result in overcorrections.
8. Monitor vital signs, electrolytes and glucose levels closely.
9. If administering respiratory support, avoid hyperoxia and iatrogenic hyperventilation.
10. Keep patient comfortable and adequately sedated (i.e., avoid shivering).

# Neonates Who Do Not Qualify for Cooling

- 1. Maintain communication with regional cooling center**
  - a. Discuss management and plan if significant clinical changes develop.
- 2. If heat sources were removed/cooling was initiated, slowly begin rewarming**
  - a. Document time of lowest temperature and source (e.g., axillary vs. rectal).
  - b. Rewarm with target rate of approximately **0.5 °C /hour**. **Avoid overheating.**
- 3. Monitor temperature periodically**
  - a. **Target rectal/core temp = 36.5°C (97.7°F) or axillary/skin temp = 36.0°C (96.8°F).**
  - b. Check temperature periodically (e.g., hourly for first 6 hours).
- 4. Check glucose and electrolyte levels.**
  - a. Fluctuations may be seen - check **Glucose** levels. **Avoid hypoglycemia**
  - b. Consider maintaining higher normal target glucose levels (e.g., **>50mg/dl**)
  - c. Consider checking **Ca, K, Mg** levels. Maintain within normal ranges.
- 5. Obtain follow-up blood gases to confirm acidosis resolving**
  - a. If acidosis persists, work-up other causes or discuss with neonatologist.

# Neonates Who Do Not Qualify for Cooling – Cont.

6. **Repeat neurologic examination** (*see appendix B*)
  - a. Document initial neurologic exam.
  - b. Repeat neurologic exam (e.g., after 1-3 hours) if clinically indicated.
  - c. Document neurologic exam at time of discharge.
  
7. **If initial acidosis severe, consider delaying enteral feeds (NPO) until improved**
  - a. Depends upon severity of clinical presentation. Discuss with neonatologist.
  - b. May require initiation of maintenance IVF fluids.
  
8. **Avoid iatrogenic hyperventilation and hyperoxygenation**
  - a. Normal **pCO<sub>2</sub>** levels (**35-45 mmHg**) – compensatory hyperventilation may be seen.
  - b. Normal **PaO<sub>2</sub>** levels (**60-100mmHg**) and **oxygen saturations (<94-98%)**.
  
9. **Consider ordering baseline labs:**
  - a. CBC, platelets and Blood cultures.
  - b. Start antibiotics if appropriate.

# Screening for HIE & Active Cooling - QI

Year	Live birth (inborn) n	Screened n <b>% live birth</b>	NICU n <b>% live birth</b> (% evaluated)	Active Cooled n <b>% live birth</b> (% evaluated in NICU)
2008-2018	42611	1824 <b>4.3%</b>	326 <b>0.78%</b> (18%)	66 <b>0.15%</b> (20%)



Updated 2/12/19

# Screening for HIE & Active Cooling - QI

Year	Live birth (inborn) n	Screened n <b>% live birth</b>	NICU n <b>% live birth</b> (% evaluated)	Active Cooled n <b>% live birth</b> (% evaluated in NICU)
2008-2018 SCVMC	42611	1824 4.3%	326 0.78% (17.8%)	66 0.15% (1.5 per 1000)
2008-2015 NC Kaiser	44 572	197 (4.4 per 1000) BE <12		45 0.1% (1 per 1000)



Updated 2/12/19



Current updates on  
HIE management

Krisa Van Meurs, MD





# Current Updates on HIE Management

## Outline

Randomized Clinical Trial results (completed)

- NICHD Late Hypothermia RCT
- NeoLEV RCT

Randomized Clinical Trials (updates)

- NICHD Preemie Hypothermia RCT
- HEAL RCT
- TIME RCT

Recently presented or published studies

- Seizures during rewarming
- AEDs after discharge
- Trophic feeds during cooling

Resources

# NICHD RCT “Late” hypothermia for HIE

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Study design: Multi-center, randomized, non-masked, Bayesian analysis

Eligibility: 6-24 hours of age with evidence of moderate or severe encephalopathy

Intervention: Whole body cooling to esophageal temperature 33.5° C x 96 hours or control

1° outcome: Death or moderate/severe disability at 18-22 months of age

Sample size: 168

Laptook A et al. *JAMA* 2017



# Should a baby be cooled after 6 hours?

How this happens:

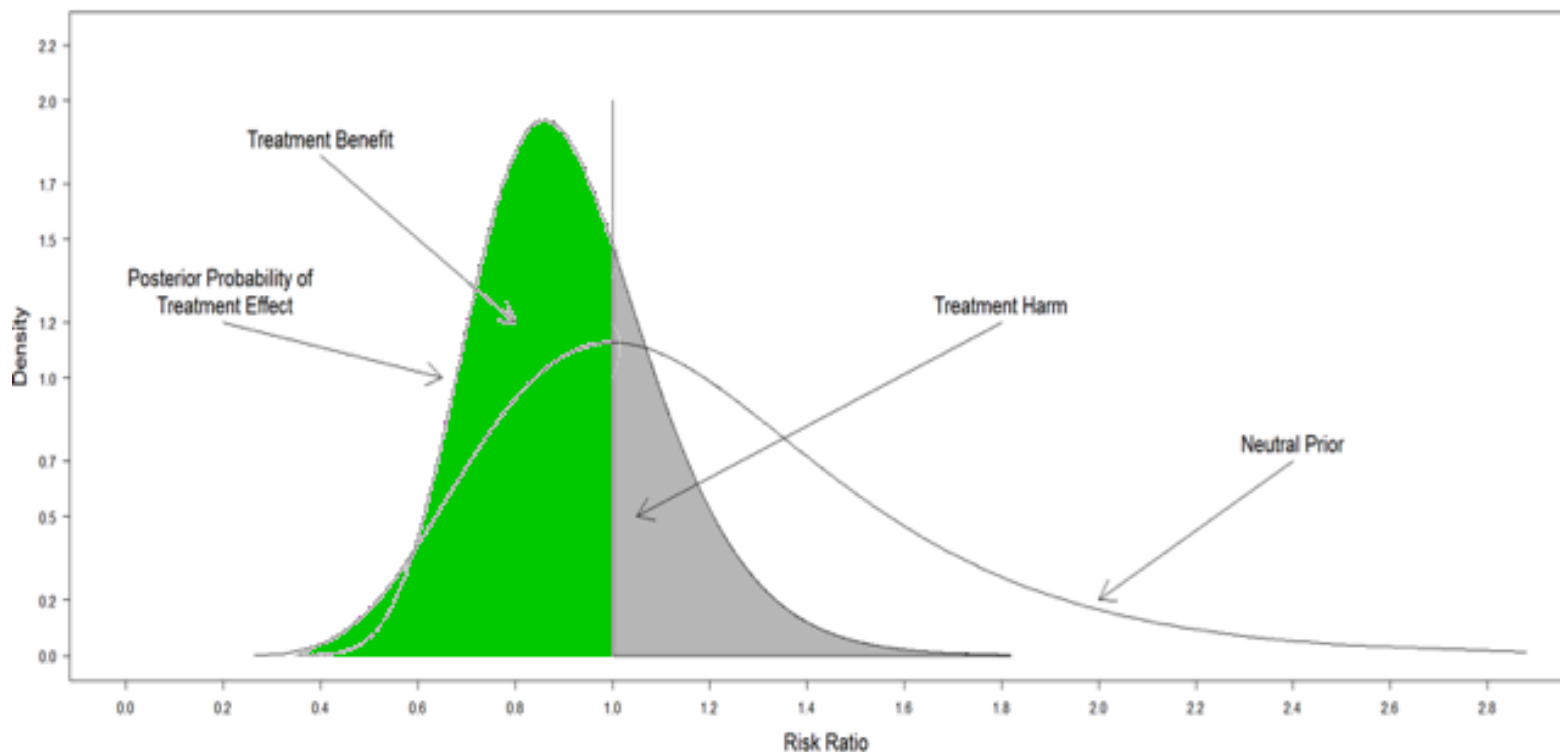
- Arrival at a cooling center after 6 hrs of age
- Progress from stage I to II/III encephalopathy after 6 hrs of age
- Are not recognized to qualify until after 6hrs of age
- Cooling cannot be initiated within 6 hours of age (equipment or personnel not available)

All Cooling Centers should work with their regional hospitals to screen and identify infants for cooling at <6 hours of age so take advantage of the benefit of cooling on death and disability.

# Adjusted Risk Ratios (aRR)\* for primary and secondary outcomes: Bayesian

	Cooled (n=78)		Non-cooled (n=79)		aRR (Neutral prior)	Probability Benefit (Neutral prior)	
	n	%	n	%	95% credible intervals	aRR<1.0	aRR<0.9
<b>Primary</b>							
Death or mod/sev disability	19	24.4	22	27.9	.86 (.59-1.29)	.77	.58
<b>Secondary</b>							
Death	9	11.5	9	11.4	.86 (0.53-1.44)	.73	.57
Severe disability	9	11.5	12	15.2	.88 (0.51-1.49)	.68	.53
Moderate disability	1	1.3	1	1.3	—	—	—
Mild disability	16	20.5	12	15.2	1.18 (0.72-1.92)	.25	.13

# Probability of treatment benefit



**Conclusion:** 77% of newborns cooled between 6-24 hours will have some benefit.

Laptook A et al. *JAMA* 2017

# NEOLEV2

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## Levetiracetam Versus Phenobarbital for Neonatal Seizures: A Randomized Controlled Trial

Cynthia Sharpe, MBChB,<sup>a,b</sup> Gail E. Reiner, DNP,<sup>b</sup> Suzanne L. Davis, MBChB, PhD,<sup>a</sup> Mark Nespeca, MD,<sup>b</sup> Jeffrey J. Gold, MD, PhD,<sup>b</sup> Maynard Rasmussen, MD,<sup>c</sup> Rachel Kuperman, MD,<sup>d</sup> Mary Jo Harbert, MD,<sup>e</sup> David Michelson, MD,<sup>f</sup> Priscilla Joe, MD,<sup>g</sup> Sonya Wang, MD,<sup>b</sup> Neggy Rismanchi, MD, PhD,<sup>b</sup> Ngoc Minh Le, MD,<sup>k</sup> Andrew Mower, MD,<sup>h</sup> Jae Kim, MD,<sup>i</sup> Malcolm R. Battin, MBChB,<sup>m</sup> Brian Lane, MD,<sup>j</sup> Jose Honold, MD,<sup>i</sup> Ellen Knodel, RCP,<sup>i</sup> Kathy Arnell, RN,<sup>k</sup> Renee Bridge, BSN, RN,<sup>i</sup> Lilly Lee, BA,<sup>j</sup> Karin Ernstrom, MS,<sup>n</sup> Rema Raman, PhD,<sup>n</sup> Richard H. Haas, MB, BChir,<sup>b</sup> FOR THE NEOLEV2 INVESTIGATORS

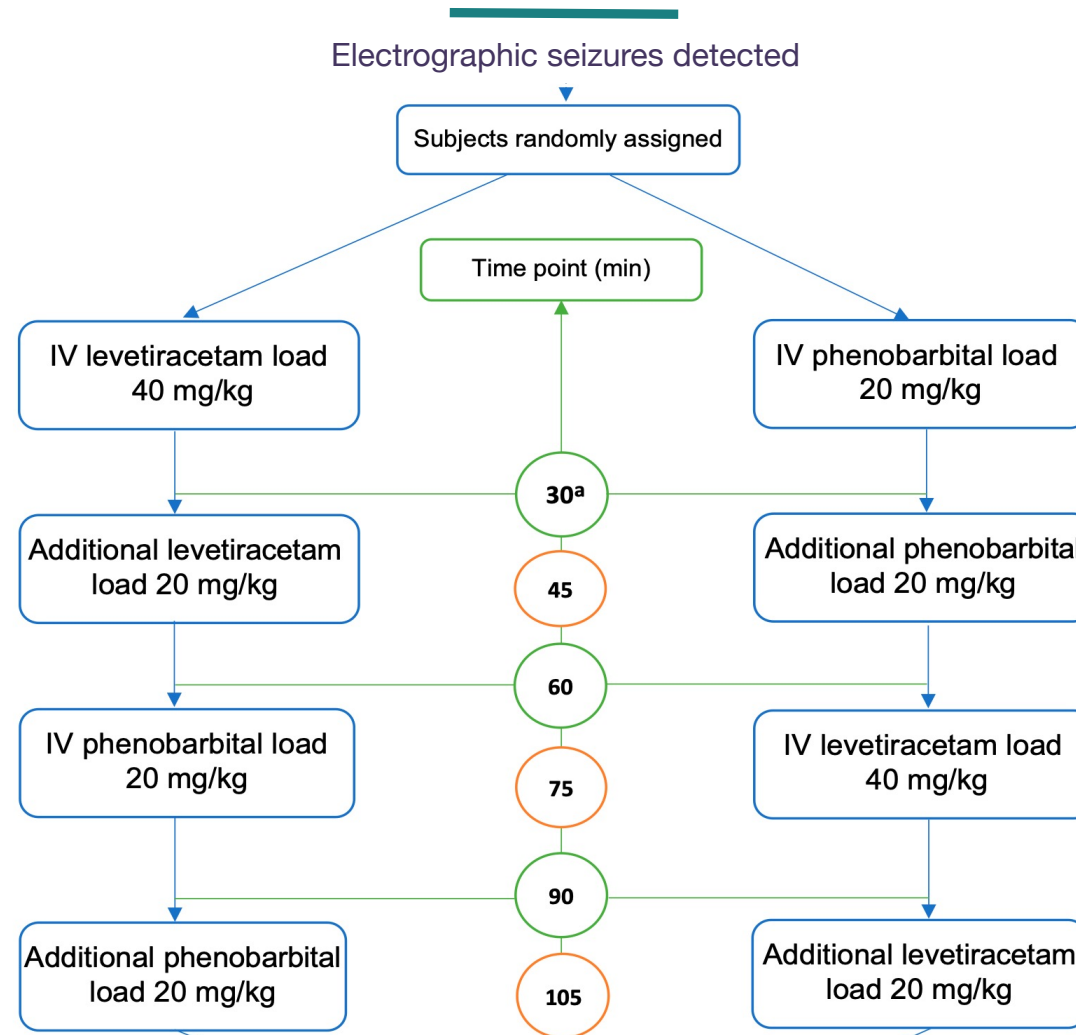
The objective of this study was to determine the efficacy and safety of levetiracetam compared with phenobarbital as a first-line treatment of neonatal seizures.

The primary outcome was complete seizure freedom for 24 hours.

PEDIATRICS Volume 145, number 6, June 2020:e20193182



# NEOLEV2 - Design



Sharpe C, et al. *Pediatrics* 2020

# NEOLEV2 - Results

	Phenobarbital n=30	Levetiracetam n = 53	P value	RR (95% CI)
Primary outcome measure 24h seizure cessation rate	80%	28%	<0.001	0.35 (0.22-0.56)
Secondary outcome measures 48h seizure cessation rate	64%	17%	<0.001	0.26 (0.13-0.53)
1h seizure cessation rate	93%	49%	<0.001	0.53 (0.39-0.7)
Subanalysis of patients with HIE treated with hypothermia 24h seizure cessation rate	90%	35%	0.014	0.39 (0.2-0.77)

Sharpe C, et al. *Pediatrics* (2020)

# NEOLEV 2 - Conclusions

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- Phenobarbital 20-40 mg/kg has a greater efficacy than levetiracetam 40-60 mg/kg.
- More adverse events occurred with phenobarbital, but the difference was not statistically significant.
- Higher dose studies of levetiracetam are warranted given the increased efficacy with dose escalation and the excellent safety profile
- Definitive studies with long-term outcome measures are needed.

Sharpe C, et al. *Pediatrics* (2020)

# Therapeutic hypothermia for HIE in premature infants 33-35 weeks gestation

- Purpose:** To determine if cooling benefits infants 33-35 weeks gestation with moderate to severe HIE
- Methods:** Randomized controlled trial whole body hypothermia with esophageal temperature 33.5° C for 72 hours
- 1° outcome:** Death or moderate to severe neurodevelopmental impairment at 18-22 months
- Sample size:** 168, enrollment completed, in follow-up phase
- PIs:** Roger Faix, MD and Abbot Laptook, MD  
NICHD Neonatal Research Network



# Need for cooling plus therapies

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	Controls	Cooled
Death or moderate to severe disability	62-83%	44-55%
Death	27-57%	24-38%
Cerebral palsy	30-48%	19-33%

**Conclusion:** Additional neuroprotective strategies are needed to further reduce mortality and morbidity.

Shankaran S et al. *NEJM* (2005)

Gluckman P et al. *Lancet* (2005)

Azzopardi D et al. *NEJM* (2009)

Simbruner G et al. *Pediatrics* (2010)

Jacobs S et al. *Arch Pediatr Adolesc Med* (2011)

# Potential Therapies to Augment Neuroprotection

- **Anticonvulsant or antiexcitatory**

Phenobarbital, topiramate, levetiracetam, **xenon**, magnesium sulfate, bumetanide

- **Anti-inflammatory or antioxidant**

Sodium cromoglicate, minocycline, indomethacin, melatonin, N-acetylcysteine, allopurinol, pomegranate polyphenols, 7-nitroindazole, 2-iminobiotin, necrostatin 1

- **Multiple mechanisms**

**Erythropoietin**

- **Growth factors and cell-based therapies**

Nerve growth factor, insulin-like growth factor 1, brain derived neurotrophic factor, **autologous cord-blood transplantation**

Modified from Johnston MV et al. *Lancet Neurology* 2011



# Erythropoietin (Epo)

Generally used for erythropoiesis, may provide neuroprotection

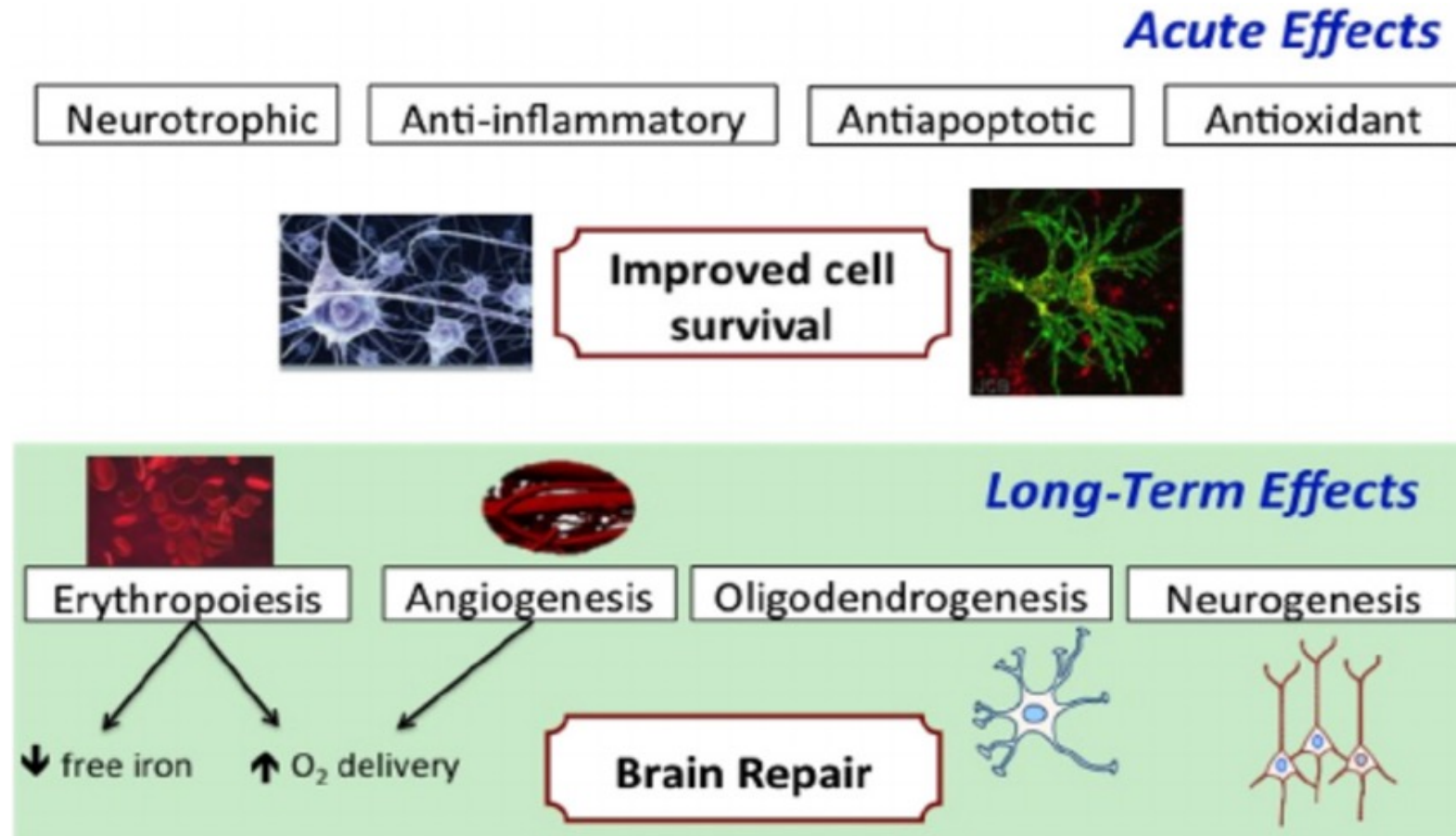


Figure from Juul SE & Pet GC. *Clinics Perinatol* (2015)

# High Dose Epo for Asphyxia and Encephalopathy HEAL trial – Phase III

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**Design:** Double masked RCT Epo 1,000 units/kg IV x 5 doses or placebo initiated at <24 hours of age.

**Primary outcome:** Death or moderate to severe neurodevelopmental impairment at 18-24 months of age.

**Secondary outcomes:** Safety, brain injury by MRI at 7 days of age, and serial biomarkers of brain injury.

**Sample size:** 500 infants, completed enrollment October 2019 and follow-up in October 2021.

**PIs:** Yvonne Wu, MD MPH and Sandra Juul, MD PhD

# Severity of encephalopathy and outcome

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	<b>Mortality</b> (%)	<b>Disability</b> (%)	<b>Normal</b> (%)
Mild	0	0	100
Moderate	5	24	71
Severe	80	20	0
All	13	14	73

Robertson C et al., Dev Med Child Neurol (1985)

Thornberg E et al., Acta Paediatrica (1995)

# What is the current practice for MILD encephalopathy?

Therapeutic drift reported in network data and small cohort studies

- Children's Hospital Network –77% of mild HIE patients cooled
- Vermont Oxford Neonatal (VON) Encephalopathy Registry – 40% did not meet criteria for moderate-severe NE
- California Perinatal Quality Care Collaborative (CPQCC) – 69% of patients with mild HIE cooled

Various definitions of MILD NE are used

- All three registries use the VON definition of NE which is not comparable to trial inclusion criteria
- Some use the presence of 1 abnormality and others use 2 or more of any severity on Sarnat exam

# Outcome of MILD HIE

PRIME study –

- Met NICHD criteria and modified Sarnat with  $\geq 1$  abnormality, **NOT cooled**
- 28 (52%) with abnormal short-term outcome (aEEG n=4, MRI n=9, abnormal discharge exam n=22)
- At 18-22 months disability seen in 7 (16%)
  - 7 with Bayley III Cognitive score  $< 85$
  - 1 with cerebral palsy (GMFCS level 4)
  - 2 with autism

Prempunpong C et al. *J Perinatol* 2017

Chalak LF et al. *Ped Res* 2019

# TIME trial

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Lucile Packard Children's Hospital



Loma Linda Children's



**TIME** trial:  
Therapeutic  
Hypothermia for  
Infants with **Mild HIE**



Rady Children's



CHOC Children's



Benioff Oakland Children's



# TIME trial: Specific Aims

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- To determine the best approach to identify, consent, and randomize term newborns with mild HIE.
- To demonstrate that therapeutic hypothermia for mild HIE is safe.
- To demonstrate that therapeutic hypothermia for mild HIE results in improved scores ( $\geq 1$  standard deviation) on the Warner Initial development evaluation of adaptive and functional skills (WIDEA-FS) and the Alberta Infant Motor Scale (AIMS) at 12-14 months of age, as an early marker of neurodevelopmental outcome.



# TIME trial: Study design

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- **Sample size:** 68 infants – 34 per treatment arm
- **Intervention:** 72 hours of TH to  $33.5 \pm 0.5^{\circ}\text{C}$  or control 72 hours of targeted temperature Management:  $36.5\text{-}37.3^{\circ}\text{C}$  using esophageal or rectal probe
- **Primary Outcome:** WIDEA and AIMS at 12-14 months of age
- **Secondary Outcomes:** length of stay, need for central lines, intubation, use of sedation, feeding status at discharge, Bayley at 24 months
- **Clinical Sites:**
  - Lucile Packard Children's Hospital
  - Children's Hospital Orange County (CHOC)
  - Loma Linda Children's Hospital
  - Rady Children's Hospital
  - Benioff Children's Hospital Oakland

# Seizures during rewarming and outcome

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**Objective:** Determine incidence of seizures during rewarming and association with abnormal outcome

**Design:** Nested cohort study of infants in the NICHD Optimizing Cooling RCT

**Methods:** aEEG tracings during rewarming were compared to 12-hour period prior to re-warming. Outcomes were determined at 2 years of age

**Results:** Seizures were more common during rewarming (27% versus 14%,  $p=0.001$ ). Death or disability was more common in those with seizures during rewarming (RR 1.7 95% CI 1.25-2.37)

Chalak LF et al. *JAMA Neurol* (2021)

# Feeding during cooling

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Concerns for NEC limited feedings during cooling in the RCTs, but there may be beneficial effects of enteral feeds after HIE.

A study of National Health Service data (2010-2017) reported 6030 neonates received TH and 31% were fed. NEC seen in 7(0.1%). Using propensity analysis, babies that were fed had less LOS, higher survival to discharge, and shorter NICU stay. Residual confounding could not be ruled out.

A survey of UK NICUs found that the rate of enteral feeding during 2014-2016 was 59%. The number of NICUs feeding increased significantly during this period. There was an increase in NICUs feeding as chronologic age increased. 58% used only donor or expressed BM.

Babies less likely to be fed if had severe HIE, on inotropes, or elevated lactate.

Hazeldine B, et al. *BMJ Paediatr* (2017)

Gayle C, et al. *Lancet Child Adol* (2021)

# Anti-seizure medications (ASM) at discharge

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The use of AEDs following HIE is controversial.

~10% of neonates with HIE develop epilepsy. Highest risk in those with neonatal seizures and abnormal brain imaging. Of those with neonatal seizures, 25% develop epilepsy. The highest rate epilepsy is with status epilepticus or severe brain injury.

Glass H, et al. *Ped Res* 2011

In a neonatal seizure registry (2015-2018) n=303, 64% had continuation of AEDs after discharge. Both epilepsy rate and functional neurodevelopment were similar.

Glass H, et al. *JAMA Neurol* 2021

**Conclusions:** These results support discontinuation of ASM prior to discharge in most infants with acute seizures.

Glass H et al. *Ped Res* 2011

Glass H et al. *JAMA Neurol* 2021

# Additional resources

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## Seminars of Fetal and Neonatal Medicine (SFNM) 2021

### **Issue 1. Daily management of neonates with NE treated with hypothermia**

*Guest Editors:* Sonia Bonifacio, Mohamed El-Dib, and Pia Wintermark, on behalf of the Newborn Brain Society

### **Issue 2. Unanswered questions for neonates with NE treated with hypothermia**

*Guest Editors:* Sonia Bonifacio, Mohamed El-Dib, and Pia Wintermark, on behalf of the Newborn Brain Society

# Additional resources

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Weekly webinars on topics related to neonatal neurology organized by the Newborn Brain Society Education Committee

## **April 2021 – Speakers & Topics**

- *Update on Neonatal Seizures – II* – Hannah Glass, MDCM, MAS and Janet Soul, MDCM, FRCPC
- *Neuroimaging – I* – Manon Benders, MD, PhD and Sudhin Thayyil, MD, FRCPCH, PhD
- *Newborn Brain Injury – The Global Perspective* – Joy Lawn, BMedSci, MB BS, MRCP(Paed), MPH, PhD and Cally Tann, MBChB, PhD, FRCPCH
- *Parents and Neonatal Brain Care* – Monica Lemmon, MD and Eleanor Molloy, MB, BCh, BAO, PhD, FRCPCH, FRCPI
- *Inter-alpha Inhibitor Proteins, Neuroprotection after Hypoxic Ischemic Brain Injury* – Barbara Stonestreet, MD

[www.newbornbrainsociety.org](http://www.newbornbrainsociety.org)

# Additional resources

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13<sup>TH</sup> INTERNATIONAL  
NEWBORN BRAIN  
CONFERENCE

FEBRUARY 9-12 • 2022  
Clearwater Beach - Florida, United States



Both in-person and virtual





Thank you!





# Demo of the CoolTool

Tom Shimotake,  
MD



# *CoolTool*: <https://www.cpqcc.org/cooltool/>

## **Northern California Neonatal Cooling Consortium Meetings started in 2010**

- *UCSF Benioff Children's Hospital Mission Bay ICN and Oakland NICU*
- *Stanford University Children's Hospital NICU*
- *Santa Clara Valley Medical Center*
- *Kaiser Permanente Northern CA*
- *California Pacific Medical Center/ Sutter Health System*

## **Working Group to develop screening toolkit for CPQCC**

*“Early Screening and Identification of Candidates for Neonatal Therapeutic Hypothermia Toolkit”*

- **Priya Jegatheesan**
- **Anna Morgan**
- **Thomas Shimotake**
- **Dongli Song**
- **Krisa Van Meurs**



**Released February 2015**

# *CoolTool*: <https://www.cpqcc.org/cooltool/>



**Mridu Sinha, PhD**



**Graduate Research Assistant, Neural Interface Lab**

UC San Diego



**University of California, San Diego**

PhD · Bioengineering and Biomedical Engineering

2012 - 2017



**University of California, San Francisco**

Certificate Program · Implementation Science: Translating Evidence into Practice, Policy  
and Public Health

2016 - 2017

- **Developed project idea for decision support tool based on CPQCCC *Early Screening Toolkit***
- Interviewed staff and providers at multiple birth centers throughout CA
- Multiple iterations of protocol and flowchart based on feedback.
- **Goal:** provide easy to use and openly accessible decision support tool for rapid identification and referral of potential candidates for cooling



# CoolTool

<https://www.cpqcc.org/cooltool/>

CoolTool Neuro Analysis

This tool is intended to promote **identification and early referral** of babies at risk for hypoxic-ischemic encephalopathy (HIE). **It does not determine if a baby should be cooled.** The decision to proceed with cooling should only be made after consultation with a Regional Cooling Center **CCS numbered letter**), based upon their institutional criteria. These recommendations are based on CPQCC's **Neonatal Therapeutic Hypothermia** toolkit.

Enter details below

Gestational Age >= 35wks \*  Yes  No  unknown



Age in Hours \*



Acute Perinatal Events



- Unknown
- Placental Abruption
- Cord Prolapse
- Uterine Distorsion

Apgar @10min



Worst Cord Blood Gas



pH BaseDef

Infant Blood Gas within 1hr



pH BaseDef

of life



CPR/Epinephrine



Unknown

Continued need for

Yes  No  unknown

assisted ventilation at 10

mins of life.



Change Input

Determine Recommendations >>

Recommendations

Disclaimer: These suggested guidelines are not a substitute for clinical judgement.

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# CoolTool

## Clinical data field

Enter details below

Gestational Age  $\geq$  35wks \*  Yes  No  unknown

Age in Hours \*

Acute Perinatal Events  Unknown  
 Placental Abruption  
 Cord Prolapse  
 Uterine Rupture

Apgar @10min

Worst Cord Blood Gas  pH  BaseDef

Infant Blood Gas within 1hr  pH  BaseDef  
of life

CPR/Epinephrine  Unknown

Continued need for  Yes  No  unknown  
assisted ventilation at 10  
mins of life.

Change Input Determine Recommendations >>

<https://www.cpqcc.org/cooltool/>

## *It's 3:13am.....*

- You receive a page at 3:13am to attend an emergent c/s delivery
- 38 y.o. G0P1 @ 41w+1d GA
- Severe prolonged decel after SROM w/ cord prolapse
- Mother is prepped in OR and you are ready but await anesthesia...
- Emerg C/S done under GAS. Baby del @ 3:45am (~32min of low HR)
- Baby emerges blue, limp and apneic. HR is <60bpm



## *It's 3:13am.....*

- You receive a page at 3:13am to attend an emergent c/s delivery
- 38 y.o. G0P1 @ 41w+1d GA
- Severe prolonged decel after SROM w/ cord prolapse
- Mother is prepped in OR and you are ready but await anesthesia...
- Emerg C/S done under GAS. Baby del @ 3:45am (~32min of low HR)
- Baby emerges blue, limp and apneic. HR is <60bpm

# *Baby emerges blue, limp and apneic...*

- You begin resus: W/D/S/S → BMV ↑ FiO<sub>2</sub> to 100%. HR <60bpm
- Despite effective BMV at 100% the **HR <60bpm**. CC begin by 1.5min
- BMV and CC → intubated by 6min of life.
- Return of HR >60bpm so CC held (total 4min of CC). No epi given
- Some color and tone improvement by 8 min of life
- Some resp effort noted and reflex irritability by 12min of life

Apgars	Color	Heart Rate	Resp Effort	Tone	Reflex Irrit	Total
1 min	0	1	0	0	0	1
5 min	0	1	0	0	0	1
10 min	1	2	0 (*intub)	1	0	*4
15 min	1	2	1 (*intub)	1	1	*6

# Baby emerges *blue, limp and apneic...*

- You begin resus: W/D/S/S → BMV↑ FiO<sub>2</sub> to 100%. **HR <60bpm**
- **CC begin** by 1.5min for **HR <60bpm** despite effective BMV at 100%
- BMV and CC → **intubated** by 6min of life.
- Return of HR >60bpm so CC held (total 4min of CC). **No epi given**
- Some color and tone improvement by 8 min of life
- Some resp effort over vent and reflex irritability noted by 12min of life.

Apgars	Color	Heart Rate	Resp Effort	Tone	Reflex Irrit	Total
1 min	0	1	0	0	0	1
5 min	0	1	0	0	0	<b>1</b>
10 min	1	2	0 (*intub)	1	0	<b>*4</b>
15 min	1	2	1 (*intub)	1	1	<b>*6</b>

# CoolTool

## Clinical data field

Enter details below

Gestational Age  $\geq$  35wks \*  Yes  No  unknown

Age in Hours \* 1

Acute Perinatal Events  Cord Prolapse  
 Uterine Rupture  
 Severe Fetal Bradycardia

Apgar @10min 1

Worst Cord Blood Gas pH BaseDef

Infant Blood Gas within 1hr of life pH BaseDef

CPR/Epinephrine CPR

Continued need for assisted ventilation at 10 mins of life.  Yes  No  unknown

Change Input Determine Recommendations >>

<https://www.cpqcc.org/cooltool/>

# CoolTool Neonatal Neuro Assessment Tool

<https://www.cpqcc.org/cooltool/>

# *FiO2 weaned, cord gas and baby gas obtained*

- HR remains >100bpm with improving color and perfusion
- O2 sats >95% and FiO2 weaned back to 21% by 20min of life
- The baby begins to recovery some tone and spont resp effort
- Cord UA gas sent: 7.25/58/28/-5

# *FiO2 weaned, cord gas and baby gas obtained*

- HR remains >100bpm with improving color and perfusion
- O2 sats >95% and **FiO2 weaned back to 21%** by 20min of life
- The baby begins to recovery some tone and spont resp effort
- Cord UA gas sent: **7.25/58/28/-5**

\*Does this cord gas mean the baby is not at risk for HIE?




# *Cord gas and baby gas obtained*

- HR remains >100bpm with improving color and perfusion
- O2 sats >95% and FiO2 weaned back to 21% by 20min of life
- The baby begins to recovery some tone and spont resp effort
- Cord UA gas sent: 7.20/52/28/-8
- Patient blood gas obtained at 30min: 6.98/42/-15
- Initial glucose = 28
- IV placed and given 2ml/kg D10W and 10ml/kg NS bolus
- Prepping for UA/UV

# CoolTool

## Neonatal Neuro Assessment Tool

<https://www.cpqcc.org/cooltool/>



Back to Cool Tool Resource Page

CoolTool
Neuro Analysis

This tool is intended to promote **identification and early referral** of babies at risk for hypoxic-ischemic encephalopathy (HIE). **It does not determine if a baby should be cooled.** The decision to proceed with cooling should only be made after consultation with a Regional Cooling Center **CCS numbered letter**), based upon their institutional criteria. These recommendations are based on CPQCC's [Neonatal Therapeutic Hypothermia](#) toolkit.

Enter details below

Gestational Age >= 35wks \*  Yes  No  unknown

Age in Hours \* 1

Acute Perinatal Events

- Cord Prolapse
- Uterine Rupture
- Severe Fetal Bradycardia

Apgar @10min 4

Worst Cord Blood Gas 7.2 -8

Infant Blood Gas within 1hr of life 6.98 -15

CPR/Epinephrine CPR

Continued need for assisted ventilation at 10 mins of life.  Yes  No  unknown

Change Input
Determine Recommendations >>

Neonatal Neuro Tool Switch to detailed view

Time of life at neuro exam: Hr Min

Seizures:  No known episode  EEG Confirmed  Suspected/Clinical

**\*\* Click to select characteristics for each row in the table below**

Level of Consciousness	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Irritable / Hyperalert	<input type="radio"/> Lethargic / Obtunded <a href="#">See video</a>	<input type="radio"/> Stupor / Unresponsive	<input type="radio"/> Cannot Assess
Spontaneous Activity	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Jittery / Increased <a href="#">See video</a>	<input type="radio"/> Decreased <a href="#">See video</a>	<input type="radio"/> No Activity <a href="#">See video</a>	<input type="radio"/> Cannot Assess
Posture	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Slight flexion / extension <a href="#">See video</a>	<input type="radio"/> Distal Flexion / Complete Extension <a href="#">See video</a>	<input type="radio"/> Decerebrate	<input type="radio"/> Cannot Assess
Tone	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Increased <a href="#">See video</a>	<input type="radio"/> Hypotonic <a href="#">See video</a>	<input type="radio"/> Flaccid <a href="#">See video</a>	<input type="radio"/> Cannot Assess
Suck	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Uncoordinated <a href="#">See video</a>	<input type="radio"/> Weak <a href="#">See video</a>	<input type="radio"/> Absent <a href="#">See video</a>	<input type="radio"/> Cannot Assess
Moro	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Exaggerated	<input type="radio"/> Incomplete <a href="#">See video</a>	<input type="radio"/> Absent	<input type="radio"/> Cannot Assess
Gag	<input type="radio"/> Normal	<input type="radio"/> Absent			

Likely severity: **Unable to Assess**

Evaluate
Print

# CoolTool

## Neonatal Neuro Assessment Tool

Neonatal Neuro Tool
Switch to detailed view

Time of life at neuro exam:  Hr  Min

Seizures:  No known episode  EEG Confirmed  Suspected/Clinical

\*\* Click to select characteristics for each row in the table below

Level of Consciousness	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Irritable / Hyperalert	<input type="radio"/> Lethargic / Obtunded <a href="#">See video</a>	<input type="radio"/> Stupor / Unresponsive	<input checked="" type="radio"/> Cannot Assess
Spontaneous Activity	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Jittery / Increased <a href="#">See video</a>	<input type="radio"/> Decreased <a href="#">See video</a>	<input type="radio"/> No Activity <a href="#">See video</a>	<input checked="" type="radio"/> Cannot Assess
Posture	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Slight flexion / extension <a href="#">See video</a>	<input type="radio"/> Distal Flexion / Complete Extension <a href="#">See video</a>	<input type="radio"/> Decerebrate	<input checked="" type="radio"/> Cannot Assess
Tone	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Increased <a href="#">See video</a>	<input type="radio"/> Hypotonic <a href="#">See video</a>	<input type="radio"/> Flaccid <a href="#">See video</a>	<input checked="" type="radio"/> Cannot Assess
Suck	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Uncoordinated <a href="#">See video</a>	<input type="radio"/> Weak <a href="#">See video</a>	<input type="radio"/> Absent <a href="#">See video</a>	<input checked="" type="radio"/> Cannot Assess
Moro	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Exaggerated	<input type="radio"/> Incomplete <a href="#">See video</a>	<input type="radio"/> Absent	<input checked="" type="radio"/> Cannot Assess
Gag	<input type="radio"/> Normal	<input type="radio"/> Absent		<input checked="" type="radio"/> Cannot Assess	

Likely severity: **Moderate**

Evaluate
Print

CoolTool | **Neuro Analysis**

This tool is intended to promote **identification and early referral** of babies at risk for hypoxic-ischemic encephalopathy (HIE). **It does not determine if a baby should be cooled.** The decision to proceed with cooling should only be made after consultation with a Regional Cooling Center **CCS numbered letter**), based upon their institutional criteria. These recommendations are based on CPQCC's Neonatal Therapeutic Hypothermia toolkit.

Enter details below

Gestational Age >= 35wks \*  Yes  No  unknown



Age in Hours \*



Acute Perinatal Events



Unknown

Placental Abruption

Cord Prolapse

Umbilical Cord Issues

Apgar @10min



Worst Cord Blood Gas



pH

BaseDef

Infant Blood Gas within 1hr  
of life



pH

BaseDef

CPR/Epinephrine



Unknown

Continued need for  
assisted ventilation at 10  
mins of life.

Yes  No  unknown



Change Input

Determine Recommendations >>

Recommendations

Empty box for recommendations.

Disclaimer: These suggested guidelines are not a substitute for clinical judgement.

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# CoolTool

## Neonatal Neuro Assessment Tool

<https://www.cpqcc.org/cooltool/>

# CoolTool

## Neonatal Neuro Assessment Tool

CoolTool Neuro Analysis

### Neonatal Neuro Tool

Time of life at neuro exam:  Hr  Min

Seizures: No known episode EEG Confirmed Suspected/Clinical

\*\* Click to select characteristics for each row in the table below

Level of Consciousness	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Irritable / Hyperalert	<input type="radio"/> Lethargic / Obtunded <a href="#">See video</a>	<input type="radio"/> Stupor / Unresponsive	<input type="radio"/> Cannot Assess
Spontaneous Activity	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Jittery / Increased <a href="#">See video</a>	<input type="radio"/> Decreased <a href="#">See video</a>	<input type="radio"/> No Activity <a href="#">See video</a>	<input type="radio"/> Cannot Assess
Posture	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Slight flexion / extension <a href="#">See video</a>	<input type="radio"/> Distal Flexion / Complete Extension <a href="#">See video</a>	<input type="radio"/> Decerebrate	<input type="radio"/> Cannot Assess
Tone	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Increased <a href="#">See video</a>	<input type="radio"/> Hypotonic <a href="#">See video</a>	<input type="radio"/> Flaccid <a href="#">See video</a>	<input type="radio"/> Cannot Assess
Suck	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Uncoordinated <a href="#">See video</a>	<input type="radio"/> Weak <a href="#">See video</a>	<input type="radio"/> Absent <a href="#">See video</a>	<input type="radio"/> Cannot Assess
Moro	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Exaggerated	<input type="radio"/> Incomplete <a href="#">See video</a>	<input type="radio"/> Absent	<input type="radio"/> Cannot Assess
Gag	<input type="radio"/> Normal	<input type="radio"/> Absent	<input type="radio"/> Cannot Assess		

Print Analysis

<https://www.cpqcc.org/cooltool/>

# The Neurologic Exam for Neonates with Suspected Encephalopathy

by  
Courtney Wustoff, MD  
(Stanford University  
Lucile Packard Children's  
Hospital)

## Neurologic Exam: Level of Consciousness Video (Moderate)

Video: Moderate Encephalopathy > Level of consciousness > Lethargic





# PediNeurologic Exam: A Neurodevelopmental Approach

by

Paul D. Larsen, MD  
(Univ of Nebraska College Med)

Suzanne S. Stensaas, PhD  
(Univ of Nebraska College Med)

## Site Index

### INTRODUCTION

- Developmental Milestones

### DEVELOPMENTAL ANATOMY

- Major Events & Growth

### NEWBORN

- Normal Exam
- Abnormal Exam

### 3 MONTH OLD

- Normal Exam

### 6 MONTH OLD

- Normal Exam

### 12 MONTH OLD

- Normal Exam

### 18 MONTH OLD

- Normal Exam

### 2½ YEAR OLD

- Normal Exam


### QUIZ

- For all 6 age groups

### SITE CONTENTS

- ...Listed by Topic

### OTHER SECTIONS OF INTEREST

- Credits
- Copyright
- Contacts & Feedback
- How to Use This Site
- Download Movies Page
- Movie Download Instructions
- Password to Unlock Zipped Movies
- Creative Commons License: Movie Use
- How to Fix Messy Fonts
- How to Show Closed Captions 
- How to add QuickTime to PowerPoint
- Health Content Disclaimer
- Site Production Notes
- Home



## PediNeurologic Exam: A Neurodevelopmental Approach

Paul D. Larsen, M.D.  
The University of Nebraska, College of Medicine



[VIEW VIDEO IN SEPARATE PAGE](#)



# *Initial Neuro assessment by exam at 1 hour of life*

- Baby breathing spontaneously → extubated to CPAP+6@21%.
- Baby is obtunded but moves spontaneously
- Making occasional short, rapid, jittery movements
- Strong distal flexion with closed fists and ankles. Legs extended.
- Hypertonic
- Weak suck, Incomplete Moro, Gag absent
- PERRL, Breathing spontaneously on NCPAP.

## Neonatal Neuro Tool

Time of life at neuro exam: 1 Hr 0 Min

Seizures: No known episode EEG Confirmed Suspected/Clinical

\*\* Click to select characteristics for each row in the table below

Level of Consciousness	<input type="radio"/> Normal <a href="#">See video</a>	<input type="radio"/> Irritable / Hyperalert	<input checked="" type="radio"/> Lethargic / Obtunded <a href="#">See video</a>	<input type="radio"/> Stupor / Unresponsive	<input type="radio"/> Cannot Assess
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Gag	<input type="radio"/> Normal	<input checked="" type="radio"/> Absent	<input type="radio"/> Cannot Assess		

Print Analysis

# CoolTool: Neonatal Neuro Assessment Tool

<https://www.cpqcc.org/cooltool/>

# CoolTool Neonatal Neuro Assessment Tool

CoolTool Neuro Analysis

This tool is intended to promote **identification and early referral** of babies at risk for hypoxic-ischemic encephalopathy (HIE). **It does not determine if a baby should be cooled.** The decision to proceed with cooling should only be made after consultation with a Regional Cooling Center [CCS numbered letter](#)), based upon their institutional criteria. These recommendations are based on CPQCC's [Neonatal Therapeutic Hypothermia](#) toolkit.

Enter details below

Gestational Age >= 35wks \*  Yes  No  unknown

Age in Hours \* 1

Acute Perinatal Events

- Cord Prolapse
- Uterine Rupture
- Severe Fetal Bradycardia

Apgar @10min 4

Worst Cord Blood Gas 7.2 8

Infant Blood Gas within 1hr of life 6.98 15

CPR/Epinephrine CPR

Continued need for assisted ventilation at 10 mins of life.  Yes  No  unknown

Change Input

Determine Recommendations >>

Recommendations

**AT RISK.**

Suggested Actions:

Refer the table below for suggested action based on neurologic assessment. For Cooling, consider the **worst exam** after initial resuscitation



Neurologic Assessment Result	Clinical Suggestions
Normal	Screens negative at <b>this</b> time. Symptoms may change. You may perform subsequent neuro exam using <a href="#">NeuroTool</a> . <b>Continue to monitor</b> as per <a href="#">CPQCC guidelines</a> .
Mild	Call cooling center to discuss case. Provide care as per the management guidelines for <a href="#">potential candidates</a>
Moderate to Severe	Call cooling center to discuss the need for transfer and cooling. Provide care as per the management guidelines for <a href="#">potential candidates</a>
Incomplete Exam	Call cooling center to discuss case immediately.

Find Regional Cooling Center


See protocols related to cooling: Choose a protocol:  Go

Print Report

# CoolTool

Printable report with

- time stamp (age)
- Additional comments
- MD signature
- Date and time

Additional Comments	
<ul style="list-style-type: none"> <li>- Apgars 1/1/*4/*6 (8intubated at 6min of life)</li> <li>- Received total 4min chest compressions</li> <li>- Initial glucose = 28</li> </ul>	

Patient History	
Gestational Age	>= 35 Weeks
Age in hours	1
Sentinal events	Cord Prolapse; Severe Fetal Bradycardia
Apgar @10 mins	4
Worst cord gas	7.2; 8
Infant cord gas	6.98; 15
CPR/Epinephrine	CPR
Continued need for assisted vent @10 mins	Yes

**Recommendations**


AT RISK.

Perform neurologic assessment after resuscitation.

Neuro Evaluation	
Time of Life at Neuro Exam	1 Hr 0 Min
Seizures	No known Episode
Level of Consciousness	Lethargic/Obtunded
Spontaneous Activity	Decreased
Posture	Distal Flexion/Complete Extension
Tone	Normal/Increased
Suck	Cannot Assess
Moro	Cannot Assess
Gag	Cannot Assess

**Likely Neuro Assessment Result**

Moderate to Severe: Call cooling center to discuss the need for transfer and cooling. Provide care as per the management guidelines for potential candidates

Additional Comments	
<ul style="list-style-type: none"> <li>- Apgars 1/1/*4/*6 (8intubated at 6min of life)</li> <li>- Received total 4min chest compressions</li> <li>- Initial glucose = 28</li> </ul>	

MD Signature	Date/Time
--------------	-----------

Print Cancel



*Other resource documents on  
CoolTool.info*

# CoolTool Regional Cooling Center finder

CoolTool **Neuro Analysis**

This tool is intended to promote **identification and early referral** of babies at risk for hypoxic-ischemic encephalopathy (HIE). **It does not determine if a baby should be cooled.** The decision to proceed with cooling should only be made after consultation with a Regional Cooling Center **CCS numbered letter**), based upon their institutional criteria. These recommendations are based on CPQCC's [Neonatal Therapeutic Hypothermia](#) toolkit.

Enter details below

Gestational Age >= 35wks \*  Yes  No  unknown

Age in Hours \* 1

Acute Perinatal Events

- Cord Prolapse
- Uterine Rupture
- Severe Fetal Bradycardia

Apgar @10min 4

Worst Cord Blood Gas 7.2 8

Infant Blood Gas within 1hr of life 6.98 15

CPR/Epinephrine CPR

Continued need for assisted ventilation at 10 mins of life.  Yes  No  unknown

Change Input Determine Recommendations >>

Recommendations

**AT RISK.**

**Suggested Actions:**

Refer the table below for suggested action based on neurologic assessment. For Cooling, consider the **worst exam** after initial resuscitation

Neurologic Assessment Result	Clinical Suggestions
Normal	Screens negative at <b>this</b> time. Symptoms may change. You may perform subsequent neuro exam using <a href="#">NeuroTool</a> . <b>Continue to monitor</b> as per <a href="#">CPQCC guidelines</a> .
Mild	Call cooling center to discuss case. Provide care as per the management guidelines for <a href="#">potential candidates</a>
Moderate to Severe	Call cooling center to discuss the need for transfer and cooling. Provide care as per the management guidelines <a href="#">for potential candidates</a>
Incomplete Exam	Call cooling center to discuss case immediately.

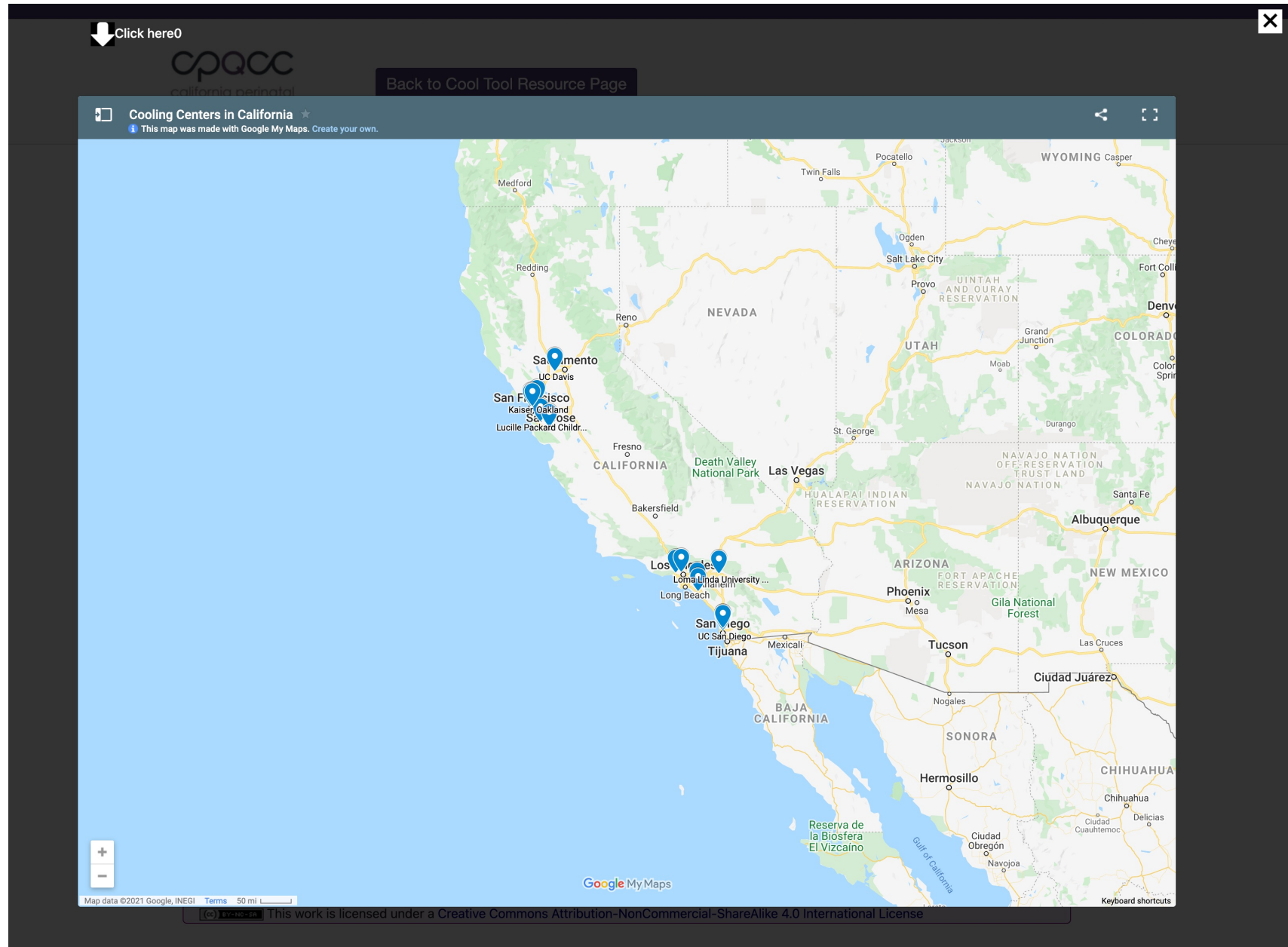
**Find Regional Cooling Center**

See protocols related to cooling: Choose a protocol:  Go

Print Report

<https://www.cpqcc.org/cooltool/>





<https://www.cpqcc.org/cooltool/>

# CoolTool Protocols and flow sheets

This tool is intended to promote **identification and early referral** of babies at risk for hypoxic-ischemic encephalopathy (HIE). **It does not determine if a baby should be cooled.** The decision to proceed with cooling should only be made after consultation with a Regional Cooling Center CCS numbered letter), based upon their institutional criteria. These recommendations are based on CPQCC's Neonatal Therapeutic Hypothermia toolkit.

## Enter details below

Gestational Age  $\geq$  35wks \*  Yes  No  unknown

Age in Hours \* 1

Acute Perinatal Events  Unknown  Placental Abruption  Cord Prolapse  Uterine Rupture

Apgar @10min 4

Worst Cord Blood Gas 7.2 8

Infant Blood Gas within 1hr of life 6.98 15

CPR/Epinephrine CPR

Continued need for assisted ventilation at 10 mins of life  Yes  No  unknown

Change Input Determine Recommendations >>

## Recommendations

### AT RISK.

#### Suggested Actions:

Refer the table below for suggested action based on neurologic assessment.  
For Cooling, consider the **worst exam** after initial resuscitation

Neurologic Assessment Result	Clinical Suggestions
Normal	Screens negative at <b>this</b> time. Symptoms may change. You may perform subsequent neuro exam using <a href="#">NeuroTool</a> . <b>Continue to monitor</b> as per <a href="#">CPQCC guidelines</a> .
Mild	Call cooling center to discuss case. Provide care as per the management guidelines for <b>potential candidates</b>
Moderate to Severe	Call cooling center to discuss the need for transfer and cooling. Provide care as per the management guidelines for <b>potential candidates</b>
Incomplete Exam	Call cooling center to discuss case immediately.

### Find Regional Cooling Center

See protocols related to cooling  Choose a protocol:  Management of Cooling Candidate  Passive Cooling Protocol  **Tip Sheet**  Flow Sheet

Disclaimer: These suggested guidelines are not a substitute for clinical judgement.

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<https://www.cpqcc.org/cooltool/>

# Protocols and flow sheets

Vital Signs Record										
DOB: _____ Time: ____ : ____ 1 <sup>ST</sup> Temperature after Birth: Date: _____ Time: _____										
Radiant Warmer turned off : <input type="checkbox"/> No <input type="checkbox"/> Yes: Date: _____ Time: ____ : ____										
Ordered By Doctor: _____ MD										
	Baseline	15"	30"	45"	1 hr	1hr 15"	1hr 30"	1hr 45"	2 hrs	2hrs 15"
Date										
Time										
Axillary	°C									
HR										
RR										
BP										
Glucose										

Goal: Maintain bat  
Temperature: Ever  
Glucose: on admis

## ABBREVIATED TIP SHEET FOR COOLTOOL

- 1) Complete and document Neuro Assessment (cooltool.info)
- 2) Contact Regional Cooling Center
- 3) Turn down/off external heat sources
- 4) Monitor core (rectal) temperature
  - a. Target rectal temperature = **33.5°C (92.3°F)**
  - b. Check temp 15 min and record on flow sheet.

<https://www.cpqcc.org/cooltool/>

## Appendix D

### Guidelines for Passive Cooling

1. Document Regional Cooling Center contacted and decision made to initiate passive cooling to be a candidate for cooling.

## Appendix E

### Management of Screened Neonates Who Do Not Qualify for Cooling

All neonates who meet screening criteria will require or qualify for cooling therapy. However, they may still have significant risk factors that warrant special consideration. These risks may range from mild acidosis to multi-organ dysfunction. In addition, initial signs of neonatal encephalopathy may be subtle and neurologic symptoms may evolve over time. In some cases, active cooling may already have been initiated. Patients without clinical evidence of perinatal asphyxia should be rewarmed only after a thorough evaluation and consultation (phone/video) with a neonatologist at a regional cooling center. Levels of concern and need for observation or interventions/therapies may be appropriate depending upon the clinical presentation.

#### Maintain communication with regional cooling center

- a. Discuss management and plan if significant clinical changes develop.

#### If heat sources were removed/cooling was initiated, slowly begin rewarming

- a. Document time of lowest temperature and source (e.g., axillary vs. rectal).
- b. Rewarm with target rate of approximately **0.5 °C /hour**. **Avoid overheating.**

#### 3. Monitor temperature periodically

- a. Target rectal/core temp = **36.5°C (97.7°F)** or axillary/skin temp = **36.0°C**



## Key Collaborators

- *Mridu Singha (UCSD)*
- *Sonia Bonifacio (Stanford/LPCH)*
- *Courtney Wutsoff (Stanford/LPCH)*
- *Krisa Van Meurs (Stanford/LPCH)*
- *Anna Morgan (Kaiser, Oakland)*
- *Joseph Schulman (CA DHHS/CA Children's Services)*
- *Dongli Song (SCVMC)*
- *Priscilla Joe (UCSF BCH Oakland)*
- *Alexis Davis (Stanford/LPCH)*
- *Alex Espinoza (Alta Bates Medical Center)*

## UCSF NICN TEAM

- *Donna Ferriero*
- *Hannah Glass*
- *Fernando Gonzalez*
- *Yao Sun*
- *Mark Petersen*
- *Dawn Gano*
- *Jim Barkovich*
- *NICN Nursing Staff*

## Bay Area Cooling Collaborative

- *UCSF BCH Oakland Children's Hospital*
- *Stanford University/Lucille Packard Children's Hospital*
- *Northern California Kaiser/Oakland*
- *Santa Clara Valley Medical Center*
- *CPMC/Sutter San Francisco Medical Center*
- *UC Davis Medical Center*

## CPQCC PQUIP

- *Henry Lee (Stanford/LPCH)*
- *Priya Jeegathesan (SCVMC)*

## Our Patients and Families



# Demo of NeoCool

Mary Harbert, MD



# Question and Answer Session

---

**Moderated by:** Henry Lee, MD & Priya Jeegatheesan, MD

**SPEAKERS:**

Dongli Song, MD, PhD

Krisa Van Meurs, MD

Tom Shimotake, MD

Mary Harbert, MD



# Closing

---

**Big thanks to our speakers & moderators  
and thank YOU for attending this webinar.**

CPQC